



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,224	08/08/2006	William G. Tong	09077-8003.US01	3313
97075 Perkins Coie LLP PO Box 1247 Seattle, WA 98111-1247	7590 02/17/2011		EXAMINER WILDER, CYNTHIA B	
			ART UNIT 1637	PAPER NUMBER
			NOTIFICATION DATE 02/17/2011	DELIVERY MODE ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentprocurement@perkinscoie.com

Office Action Summary

Application No.

10/540,224

Applicant(s)

TONG, WILLIAM G.

Examiner

CYNTHIA B. WILDER

Art Unit

1637

Period for Reply -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 26 July 2010.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3,5-7 and 17-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3,5-7 and 17-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-945)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 7/26/2010 has been entered. Claims 1, 2 and 3 have been amended. Claims 4 and 8-16 have been canceled. Claims 1-3, 5-7 and 17-22 are pending. All of the amendments and arguments have been thoroughly reviewed and considered. Applicant's amendment necessitated the new grounds of rejections presented in this Office action.

New Ground(s) of Rejections

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-3, 5-7 and 17-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sandstrom, P (US20030174324, effective filing date August 2000) in view Weinberg et al (US 6248540, June 2001) and further in view of Tong (5600444, February 1997) and Tong (6141094, October 2000).

With regards to claims 1-3, 5-7 and 17-22, Sandstrom provides a method for processing microarrays comprising a plurality oligonucleotides and methods for screening polymers on microarrays to detect biological activity (0126-0142). Sandstrom teaches wherein the microarray is combined with an optical signal detection system comprising an optical detector (0008-0021 and 0039-0053). Sandstrom teaches measuring an output of the optical detector to represent a signal (0167); and removing background noise by scanning blank area adjacent DNA cells (0019, 0053, 0148 and 0173). Sandstrom teaches that blank areas allow reduction of background noise (0173) and comparison of non-specific hybridization (0019). Sandstrom et al also teaches determining inhomogeneity of DNA cells at different locations on the microarray pages 13 and 14).

Sandstrom et al do not expressly state that a blank area is between two DNA cells. However, Sandstrom et al teach that the reference cites may be located anywhere on the array and may be interrogated (and subtracted) for the purpose of

reducing noise (0173). Sandstrom et al teach that the reference sited are basically empty (blank) sited and have no hybridization potential. Sandstrom teaches that a number of these sited can be placed on the array and each integration of emission from a hybridization probe site may involve a subsequent subtraction of a reference (blank) site (0173). Thus, Sandstrom et al provides sufficient motivation for including blank areas that may be located between two adjacent DNA cells with reasonable expectation of success.

Sandstrom also does not teach wherein the microarray is placed in an optical degenerate four-wave mixing (DFWM) systems or steps for performing the optical DFWM system for analysis or removing background noise based on DFWM measurements.

Weinberg et al teach a method for screening compounds attached to a microarray, wherein said screening of said array comprise detection via optical spectroscopic techniques (col. 10, lines 12-26 and col. 27, lines 38-44), wherein said optical spectroscopic techniques include the use of a degenerate four wave mixing optical technique that depends on the interaction of three photons to produce the fourth photon, i.e., the signal, and only one wavelength, wherein the signal is a coherent beam easy to detect (col. 28, lines 52-57). Wienberg et al teach that DFWM is unlike fluorescence which is emitted in all directions and is therefore easy to detect at higher sensitivity (approximately 10,000 molecules under favorable conditions. Wienberg et al teaches that the selectively of this techniques relies on the absorption properties of the species being detected and can be thought of as being analogous to absorption

spectroscopy except that it is more sensitive, more selective and has a higher spatial resolution (col. 34, lines 26-57).

While Weinberg provides sufficient motivation for why one would want to use DFWM for screening a microarray versus other techniques, such as e.g., optical spectroscopy systems based on fluorescence as taught by Sandstrom, Weinberg et al does not teach how the DFWM system specifically operates to generate a DFWM signal and further does not teach the use of DFWM measurements for removing background noise.

Tongs ('444) supports the limitations of the claims 5-7 and 17-22, Tong teaches a device and technique for performing highly sensitive spectroscopic measurements in a sample using a four-wave mixing laser beams in nonlinear degenerate four wave mixing optical system (abstract). Tong teaches that an alignment template having holes for transmitting beams. Tong teaches that the templates serve as spatial filters to prevent the scattered background light from reaching the optical detector. Tong et al teach that the template may be made by simply forming four small holes, one for each beam involved in a four wave mixing process, in tow thin aluminum plates. Tong et al teach that the template is position relative to a furnace chamber so that holes define the path of the forward pump, holes define the path of the probe, holes define the path of the signal beam, and holes define the path of the backward pump. Tong et al teach that the positions of the templates are fixed relative to each other for a desired four wave mixing configuration (Col. 4, lines 22-65 and Figure 2). Tong teaches wherein the DFWM system comprises backward scattering or forward scattering. Tong teaches that

DFWM comprising backward and forward scattering configurations are useful because of the phase conjugate property of the signal beam. Tong teaches that the phase conjugate property of the signal beam generated by an analyte in DFWM method has potential applications including autocorrection of beam distortion or optical aberration (col. 13, lines 19-35)

Tong ('094) supports the teachings of Tong above and further teaches steps of removing a background noise in the generated DFWM signal by using the measurement of a blank area between one DNA cell adjacent a DNA cell (see col. 6 and 7; see also Figure 3). Tong teaches that DFWM is advantageous because of the nonlinear signal properties, such as cubic power dependence, virtually 100% optical collection efficiency, and laser-like coherence properties of the signal beam. Tong teaches that unlike laser-induced fluorescence methods where the signal is a small fraction of a widely diffused fluorescence signal laser, the wave-mixing signal as a collimated coherent laser-like beam and hence nearly the entire signal beam can be directed into a photodetector. Tong teaches that since wave mixing is an absorption method, both fluorescing and non-fluorescing analytes can be measured (col. 9, lines 29-47).

It would have been *prima facie* obvious to one of ordinary skill in the art at the time of the claimed invention to improve the microarray fluorescence detection system of Sanstrom comprising a plurality of DNA cells and reference (blank) cells with a microarray system comprising an optical DFWM system as taught by Weinberg in view of Tong '444 and Tong'094 based on the improved advantages taught by secondary references. Firstly, Weinberg teaches that DFWM is unlike fluorescence and is easy to

detect at higher sensitivity. Wienberg et al teaches DFWM is more sensitive, more selective and has a higher spatial resolution (col. 34, lines 26-57). Secondly, Tong '094 Tong teaches that DFWM is advantageous because of the nonlinear signal properties, such as cubic power dependence, virtually 100% optical collection efficiency, and laser-like coherence properties of the signal beam. Tong teaches that unlike laser-induced fluorescence methods where the signal is a small fraction of a widely diffused fluorescence signal laser, the wave-mixing signal as a collimated coherent laser-like beam and hence nearly the entire signal beam can be directed into a photodetector. Tong teaches that since wave mixing is an absorption method, both fluorescing and non-fluorescing analytes can be measured (col. 9, lines 29-47). Thus given the advantages of Weinberg and Tong, it would have been obvious for one ordinary skill in the art to be motivated to use a DFWM system for analyzing the microarray rather than fluorescence-based optical analysis systems as taught by Sanstrom. The use of an optical DFWM system in combination with microarray analysis is within the ordinary artisan's technical grasp as by suggested by Weinberg and Tong.

Response to Arguments

Applicant's traversal

5. Applicant traverses the rejections on the following grounds: Applicant asserts that the amendment clarifies that the a blank area is located between two adjacent DNA cell, wherein the black area is separated from the cells and removing a background noise in the in the measured DFWM signal of the one DNA cell by sing a DFWM measurement of the blank area between the one DNA cell and adjacent DNA cell.

Applicant asserts that this is possible because of the specific use of the DFWM system as claimed. Applicant states that the instant invention as amended distinguishes it from the use of blank areas cell sited used in Sandstrom which relies on fluorescence technology rather than DFWM technology as Sandstrom cannot provide the necessary high spatial resolution to be able to use the blank space between the DNA cell sites and thus must use the DNA cell sited as a blank. Applicant states Weinberg and Tong does not cure the deficiencies of Sandstrom and further does not contemplate the claimed application of DFWM on a microarray to remove background noise as claimed.

Examiner's Response

6. All of the arguments have been thoroughly reviewed and considered but are not found persuasive for the reasons that follow: In response to Applicant arguments concerning the teachings of Sandstrom et al and the lack of a teaching of a blank array and removing background, MPEP states that, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Contrary to Applicant's arguments, Sandstrom provides sufficient evidence of providing an array comprising a blank area and the elimination of background signal based on the blank area. While the Examiner agrees that Sanstrom does not teach wherein the blank is between two DNA cells, Sanstrom teaches that the blank areas may be located anywhere on the microarray, which ultimately gives the practitioner the option of having blank areas between adjacent DNA cells. This concept is within the ordinary artisan capabilities and technical

grasp. With regards to Applicant's arguments concerning the use of a DFWM system with the micrarray, it is the Examiner's position that the secondary references provides sufficient evidence that a microarray could be combined with a DFWM system and further provides evidence as to why one would want to improve microarray detection by using a DFWM system instead of a fluorescent base system as taught by Sandstrom. Thus, Applicant's arguments are not found persuasive. Applicant's attention is once again directed to *KSR Int'l Co. v. Teleflex Inc.* (550 U.S.____, 127 S. Ct. 1727 (2007)) where the Supreme Court determined that "a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103 (*KSR*, 550 U.S. at ____, 82 USPQ2d at 1397)." The Supreme Court also determined that "[t]he combination of familiar elements according to known methods is likely to be obvious when the combination does no more than yield predictable results (*KSR*, 550 U.S. at ____, 82 USPQ2d at 1395)." Thus *KSR* forecloses the argument that a specific teaching, suggestion, or motivation is required to support a finding of obviousness.

In this case, the combination of the microarray comprising an optical detector as taught by Sandstrom with the optical degenerate four wave mixing system of Weinberg and Tong and Tong would have yield predictable results of improving the system of Sandstrom by improving sensitivity and spatial resolution.

Conclusion

7. No claims are allowed. Any inquiry concerning this communication or earlier communications from the examiner should be directed to CYNTHIA B. WILDER whose telephone number is (571)272-0791. The examiner can normally be reached on a flexible schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on (571) 272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000

/Cynthia B. Wilder/

Examiner, Art Unit 1637